Mountaintop Mining/Valley Fill Environmental Impact Statement
Technical Study

WORK PLAN APPROACH FOR STREAMS

July 27, 1999

I. Problem Statement

A typical mountaintop mining/valley fill (MTM/VF) operation in the Appalachian coalfields removes overburden and interburden material to facilitate the extraction of low-sulfur coal seams, and requires placement of excess spoil into valleys containing first and second order streams. Direct and indirect physical, chemical, and biological effects of these operations on downstream reaches has not been well documented.

While current mitigation and reclamation practices are designed to minimize adverse water quality effects, the effect on downstream biological communities is less certain. Headwater streams transport a portion of the downstream biological energy budget from leaf litter and other terrestrial sources of dissolved and fine particulate organic carbon. Downstream biological communities are adapted to existing physical, chemical, and biological conditions within these stream arrays. Therefore, it is uncertain to what extent downstream invertebrate communities or fisheries are being adversely affected by MTM/VF activities impacting headwater reaches. This work plan proposes to study the site specific and cumulative effects of MTM/VF mining operations on stream chemistry and stream ecology as described below. To be successful, this work plan will require industry cooperation to gain access to sites, to collect data, and to assess opportunities for improvement in the data collection and/or reporting requirements associated with the current permitting process.

II. Goals and Questions to be Addressed by This Work Plan

The steering committee for the Environmental Impact Statement (EIS) has adopted goals and questions to be addressed from several different perspectives: environmental, regulatory, and public service. This work plan, in conjunction with the other work plans and technical symposia that will be conducted during the preparation of the EIS, will attempt to address the following goals as adopted by the committee:

- To determine the impact on environmental resources (including aquatic resources) from the size and location of excess spoil disposal in valley fills associated with mountaintop mining operations,

- To show... how such mining operations might be carried out in a way that minimizes adverse impacts to streams and other environmental resources, and

- To examine how to improve environmental assessment and design of individual mining projects.

Similarly, this work plan will attempt to answer the following questions posed by the EIS steering committee:

- How will we measure the effects (impacts) of mountaintop mining operations and associated valley fills on streams and aquatic life?

- What are the most appropriate qualitative and quantitative measures of effectiveness of stream restoration?

- What are the short- and long-term effects of individual mountaintop mining operations and associated valley fills on the physical, chemical and biological conditions of affected streams and their watersheds, both within the area of direct impact and downstream? In answering this, consider water quality and quantity, changes in aquatic habitat, and stream use.

- What are the expected effects likely to be on aquatic species of federal and state concern (i.e. listed and proposed threatened and endangered species, candidate species and species of special concern)?

- What are the relative individual and cumulative effects of a single large valley fill versus multiple small headwater fills? In answering this question, assess the relative value of headwaters and their contribution to the physical, chemical and biological health of the larger watershed.

- How do we reach a better scientific consensus on the water quality/aquatic habitat values of valley headwater streams so that the on-site impacts of fills, and the resulting mitigation, restoration and reclamation requirements can be judged more effectively -- both in the fill area and downstream? What does "minimize" environmental damages mean in this context?

- How do we evaluate and improve stream restoration practices so that ecological health and viability are returned to waters on mined landscapes; how quickly can ecological restoration be achieved; what is the extent and nature of irreversible loss of stream habitat from mining?

- How effective have the reclamation practices and compensatory mitigation measures required to date for mountaintop removal and other mountaintop mining operations, and for valley filling, been in offsetting the adverse effects of such activities on aquatic environments? What have

been the frequency, results and effectiveness of follow-up compliance monitoring?

- After evaluating the combined effects of mining and other surface disturbing activities, and the offsetting effects of reclamation and compensatory mitigation, what are the expected net cumulative effects of existing, ongoing and all viable future mountaintop mining operations on the aquatic environments of the Appalachian coalfields region? What impacts will the future projects have on environmental resources, including waters of the U.S. and fish and wildlife?

- What environmental analyses should be required before a mining plan is submitted? During mining? After mining and reclamation end?

- What criteria should be used to determine whether a fill may be placed in a stream?

- To what degree are the drainage control measures being established on fills able to replace aquatic habitats that existed prior to construction of the fill, and can designs be modified to further enhance or accomplish this?

- Regarding the effectiveness of existing forms of mitigation associated with valley fills in replacing or providing substitute resources, can existing forms of mitigation be modified to further enhance or accomplish this?

- What is a stream? The agencies should develop a mutually acceptable approach for reconciling the interagency and interstate differences concerning the definition of streams.

III. EIS Team Members and Experts Consulted

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DOE/FETC: Heino Beckert
WVDEP: Ken Politan, John Wirts
WVDNR: Walter Kordek, Michael Hoeft, Dan Cincotta
KYDFWR: Marty Barbour

Experts Consulted: Bruce Wallace, University of Georgia; Stephen Handel, Rutgers University; and Frank Borsuk, Potesta & Associates

IV. Evaluation of Existing Data

A. Stream Chemistry

A significant amount of water chemistry data exists from which limited site specific water quality impact analyses can be derived. Much of the data are in an electronic database (WVDEP OMR Discharge Monitoring Report (DMR) data on pH, iron, manganese, aluminum, TSS, and flow; and WVDEP OWR watershed studies data on pH, temp, DO, conductivity, iron, manganese, aluminum, nutrients, alkalinity, acidity, and TDS). Another significant source of data can be found in paper form in permit applications (baseline stream data and "Table C") and WVDEP OMR mining company quarterly stream monitoring reports (pH, TDS, TSS, acidity, alkalinity, iron, manganese, specific conductance, estimated flows, and sulfate). A significant amount of baseline information may also be derived from the previous EPA Areawide Assessments for Issuing New Source NPDES Permits for Coal Mines in WV watersheds, from the existing EPA STORET data base, from KY and VA mining files, and from previous studies undertaken by the USGS, the US Forest Service (USFS), and others at mining sites within the study area footprint.

Despite this wealth of monitoring information, gaps exist (DO, temperature, hardness, nitrate, nitrite, total phosphorus, and organic carbon in both DMRs and quarterly reports; aluminum and measured flow in quarterly reports). Some of these data are collected in the WVDEP OWR watershed studies and could provide baseline information, but are missing from the DMRs and/or quarterly reports. Therefore, the evaluation of changes from baseline conditions may not be possible for several of the parameters using only existing information. Based in part upon the results, the applicability of requiring the collection of these data in future DMR and mining company quarterly reports should be considered. Sediment loadings will also be analyzed in order to assess potential downstream biological effects.

B. Stream Biology

Prior to 1998, companies submitted only limited benthic data in WV surface coal mining permit applications. However, as of November 1998, coal companies are required to provide detailed benthic data prior to permit issuance where valley fills are proposed in watersheds larger than 200 acres. Quality Assurance/Quality Control (QA/QC) procedures being used during the collection of these data, and hence the validity of the data, have not been demonstrated. Permit application data exist in WVDEP OMR files in Nitro, WV and in files in EPA Region III's Water Division. Similar data are also presumed to exist in KY and VA mining files. These data, and the QA/QC procedures employed during their collection, will be evaluated in the EIS. Additional benthic data will be available

shortly in electronic form from WVDEP OWR at 234 sites in the WV portion of the study area, including 12 sites in Spruce Creek, 11 sites in Clear Fork, 17 sites in Twentymile Creek, and 3 sites in the Upper Mud River. Further, EPA has collected recent data on two mining sites in the Upper Mud and Spruce Fork watersheds. Finally, data may also exist from previous studies conducted by the USGS and/or USFS at sites within the study area footprint. These data should also be collected and analyzed in the EIS.

Because the amount and quality of benthic impact data for existing mining operations are variable, field studies will be undertaken to collect and analyze benthic impact data. Based in part upon the results of these studies, the program review portion of the EIS should consider requiring that future permits contain specific biomonitoring QA/QC collection and reporting requirements.

V. Data Collection Approach

Using the above referenced data sources, the EIS contractor will be tasked to compile and analyze chemical and biological data in watersheds targeted for field study during the Summer and Fall of 1999. Field studies will be undertaken in target watersheds that have or are likely to be affected by MTM/VF operations, both to provide an additional data set to be used in the EIS contractor's comparative analysis, and to fill the information gaps identified above. These field studies will be initiated in the Spring of 1999 and carried out through the Spring of 2000. Any studies completed or undertaken by other institutions, i.e.- Marshall University or West Virginia University, should also be considered in the EIS findings as appropriate.

A. Collect Existing Data

1. Stream Chemistry

a). Table C heavy metals discharge data should be collected and compared to the numerical criteria established for the parameters found in WV Title 46 Series 1 Legislative Rules. The purpose would be to identify parameters that may have instream impacts and that might warrant further reporting or monitoring requirements. This effort will be performed by the EIS contractor during the Summer/Fall of 1999.

b). Baseline data from permit application submissions, data from discharge monitoring reports, and quarterly stream monitoring data will be collected, and where such data can be demonstrated to have been collected using proper QA/QC procedures, comparisons of baseline chemistry data to discharge and quarterly report data will be made. The purposes would be to identify changes from baseline concentrations, to evaluate the significance of these differences, and to identify trends. This effort will be performed by the EIS contractor during the Summer/Fall of 1999.

c). Stream chemistry parameters found in WVDEP OWR, KYDSMRE, KYDFW, KYDEP, VADMLR, EPA, USGS, and/or USFS files will be collected and compiled at target sites where mining has occurred in the targeted watersheds. These data, as well as data collected from field monitoring efforts, will then be compared to properly QA/QC'd permit application baseline data, quarterly stream monitoring data, and DMR data to evaluate, compare, and contrast information in the different data sets. The purposes would be to provide additional assessment of MTM/VF impacts, and to determine the degree to which the different data sets correlate, thereby establishing confidence levels in the reported data sets. This effort will be performed by the EIS contractor during the Summer/Fall of 1999.

2. Stream Biology

WVDEP OMR and similar KY and VA biological data should be forwarded to the Wheeling EPA office for entry into its electronic database. These data, when supplemented by WVDEP OWR data that will be available shortly in electronic form at 234 sites throughout the WV portion of the study area, will provide a baseline of benthic data to compare with field study results. The EIS contractor will be tasked with collecting additional relevant information from other state and federal files that may be identified by the team during later stages of project development.

B. Collect New Data

Field work will be undertaken beginning in the Spring of 1999 to supplement the collection and analysis of existing data, and to fill information gaps identified above. Benthics will be collected quarterly beginning in April 1999, and chemistry samples will be collected monthly beginning in August of 1999 pending completion of the QA/QC plan and the training of the WVDEP inspectors in approved collection methods. One study objective will be to evaluate, compare, and contrast conditions in three categories of streams: 1) "undisturbed" streams, 2) streams in mined areas with valley fills, and 3) streams in mined areas without valley fills; all with the primary purpose of assessing the impacts from mountaintop mining and valley fills. A second objective will be to assess cumulative impacts resulting from multiple fills in a single watershed. Here, some sampling sites should be located downstream of several fills. This will require the sampling of additional undisturbed sites that are representative of the larger streams, which will increase the complexity of the study effort. A third objective will be to assess the ecological value of sediment control structures (ponds and ditches). Several of the sediment control structures will be sampled to determine what kinds of benthic assemblages are present.

Several criteria for selection of candidate watersheds have included:

- Watersheds selected for mining or post-mining impact studies have baseline water quality and benthic information against which conclusions can be drawn.

- Watersheds selected for study are susceptible to future MTM/VF operations.

- Watersheds contain a sufficient number of active and reclaimed valley fills of varying sizes to maximize the number of possible study locations, and to facilitate cumulative effect scenarios.

- Appropriate reference or control sites are identifiable.

- Watersheds should be evenly distributed across the study area so the results are transferable throughout the EIS study area.

The following WV watersheds have been selected for in-depth study based upon team member application of above criteria using best professional judgement: Clear Fork to the Coal River, Spruce Fork, Twentymile Creek, Island Creek, and the headwaters of the Mud River. The team also recommends that one or more watersheds be selected in the EIS study area outside of West Virginia. The team has tentatively identified two such watersheds in Kentucky: Spring Fork of Quicksand Creek, and Coppers Fork in Belle County. Study sites within the Starfire Mine Complex in KY are also being considered.

Water chemistry and biological data collection activities are designed to assess changes from baseline or control conditions. The data collected will help assess flow, chemistry, habitat (stream/riparian), aquatic life (benthic and fish), bed substrate stability, geomorphology, and energy transport.

Data collection points were determined by site specific conditions, and located to assess the three categories of streams described in the first objective, the cumulative impact sites described in the second objective, and the sediment control structures described in the third objective. Working with WV and/or KY inspectors knowledgeable of the watersheds identified above, potential streams and data collection points within each watershed where benthic and chemical data might be collected were identified. These sites were field checked to verify accessibility, and whether they indeed represented good monitoring locations. Locations were recorded to assure that the same monitoring stations are used throughout the study.

Chemistry samples will be taken monthly. Benthic samples will be taken seasonally. A semi-quantitative approach will be used for the collection of benthic samples at each benthic sampling station. In addition to taking semi-quantitative benthic samples at all benthic stations in the targeted watersheds, quantitative benthic samples will also be taken in several paired watersheds (mined/unmined).

NOTE: Fish samples will also be collected and analyzed at selected locations within the watersheds that have been targeted for benthic and water chemistry sampling. See the **Fisheries Survey** Work Plan.

VI. Interpretation of Data

A. Evaluating Usefulness of Existing Monitoring Data to Assess Impacts

Scoping sessions have indicated that there may be a credibility issue with the monitoring data now being collected and reported to the regulatory agencies. From a brief analysis of the existing data sets, questions have also been raised regarding the completeness of the data now being collected, when during the mining process data is collected, and how the data is currently being used by the regulatory agencies in assessing impacts to stream communities. One of the purposes of this work plan, therefore, is to evaluate current monitoring practices and to recommend improvements to monitoring protocols that will increase the protection of aquatic communities.

Existing regulatory protocols require mining companies to perform chemical monitoring of both baseline and impact conditions, and recent changes have improved the types of baseline biological data that must be collected. However, it is suspected that some parameters currently being reported by companies have not been used by regulatory agencies, that certain parameters that could be useful are not being reported (hardness, organic carbon), and that the types and amounts of data being collected may be inadequate to assess site specific and/or cumulative effects of MTM/VF activities. Questions have also been raised about the QA/QC procedures being utilized.

To evaluate the data integrity issue, the EIS contractor will compile chemical and biological information from existing files, evaluate the methods by which these data were collected, and, where possible, to correlate overlapping data points from independent monitoring efforts (mining company, WV, KY, VA, USFS, USGS, FWS, etc). The EIS contractor will report all discrepancies or data integrity issues identified, and will recommend appropriate
improvements to MTM/VF monitoring processes and procedures.

If confidence can been established in particular data sets, the contractor will indicate whether any observable relationships can be identified between site specific chemical and biological conditions based on the available monitoring information. The contractor will also evaluate whether sufficient monitoring information exists from which cumulative chemical or biological effects of MTM/VF activities in headwater streams can be assessed at downstream locations (in 2nd or 3rd order streams). If such site specific or cumulative observations cannot be made using the existing monitoring information, the contractor will identify what improvements should be made to the monitoring process (QA/QC, parameters, locations, time frames, etc) that might make such observations possible.

Finally, as appropriate, monitoring information collected during field efforts will be compared to existing monitoring information collected at MTM/VF sites (where proper QA/QC procedures have been employed), and used to evaluate the degree to which such additional monitoring information may be useful in designing an enhanced monitoring program.

B. Field Evaluation of Chemical and Biological Impacts

As part of this study, collection of stream chemistry and biological data will be undertaken to assess site specific and cumulative effects of MTM/VF activities.

All biological data collected in the field will be compared to reference/control conditions to assess degree of impact. The reference/control condition will define a threshold with some degree of certainty determined by the precision of the sampling methods. Anything less than the reference/control threshold will be called impaired. The continuum of impairment can be divided to express slight, moderate, and severe impairment.

To the extent possible:

-- Water chemistry, habitat conditions, substrate size, and other stressor indicators will be correlated to benthic and fish assemblages. Relationships between the stressor and response variables will be reported.

-- The conditions representative of the three categories of streams described in the first objective, the cumulative impact sites described in the second objective, and the sediment control structures described in the third objective will be compared and described. The report will explain whether the differences in conditions is ecologically significant.

-- Cumulative impacts will be described. This may be very difficult as an appropriate reference/control condition for the larger streams and watersheds may be difficult to find. It may be easier to find appropriate reference/control conditions for the smaller, headwater streams.

-- Recommendations regarding current and/or future MTM/VF mitigation and/or reclamation practices will be made.

C. Evaluation of Existing Stream Restoration Practices

MTM/VF operations eliminate surface waters existing within fill areas. Sediment ditches are constructed to convey sediment loadings from the mined areas, but are discounted for purposes of mitigation. Current stream mitigation practices in WV typically involve either the combination of an on-site stream reconstruction project and the payment into a statewide fund to restore streams located off-site, or by sole payment into the fund. Off-site restoration projects may or may not occur within the same watershed being impacted by the operation.

The degree to which on-site stream restoration is mitigating the impacts of MTM/VF operations is uncertain. As part of the field study, an attempt will be made to locate stream chemistry and biological monitoring stations in streams that have been restored on-site, in the sediment ditches located adjacent to valley fills, and in downstream locations. Results will be compared to reference/control conditions.

A separate work plan, **Aquatic Ecosystem Enhancement**, will evaluate stream restoration or aquatic area creation practices at mining sites associated with MTM/VF operations.

VII. Projected Study Costs

Benthic and stream chemistry samples will be collected by agency field crews and stream chemistry samples will be analyzed in the EPA laboratory at Fort Meade, Maryland. Data collection activities to be performed by the EIS contractor have been funded through EPA's EIS contract.

Additional funding will be necessary for the laboratory analyses associated with the benthic monitoring efforts. The following funding will be needed to complete the analyses of the benthic samples:

FY99: $ 73,920
FY00: $147,840
FY01: $147,840

For further information regarding this work plan, please contact Mr. William J. Hoffman at (215) 814-2995, or at Hoffman.William@epa.gov.